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UNITED STATES PATENT APPLICATION

of

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for

APPARATUS AND METHOD FOR FINISHING CONCRETE DURING A LEVELING PROCESS

PRIORITY CLAIM

1. This application claims the priority of my United States Provisional Patent Application S. N. 60/218119 which was filed on 13 July 2000.

FIELD OF THE INVENTION

2. This invention relates to concrete structures having a flat upper concrete surface.

BACKGROUND OF THE INVENTION

3. Concrete is extensively used in structures because of its wide availability, low cost, and extremely long useful life. The concrete material is a mixture of several earthen ingredients - - typically, about five - - which when water is added to them will then combine chemically to become a hard and rigid integrally formed member. Unless a curing compound is used to speed the process, the chemical combination of the ingredients made possible by the presence of moisture occurs first rapidly but then gradually over a period of several weeks as the strength of the member approaches its ultimate maximum.

4. As is commonly understood, a concrete structure is inflexible and is not intended to be twisted or bent. Concrete has a very low tensile strength, such as ten pounds per square inch, but a high compressive strength, such as 3000 pounds per square inch. Because of its low tensile strength it can be easily broken if pulled or twisted. A very common and nearly universal practice, therefore, is to provide a metal reinforcing grid or frame about which the concrete mix, when wet, is poured. The steel rods used in such a reinforcing frame are commonly referred to as "rebar".

5. Structures of various geometric configurations can be made of concrete. For vertical walls a common practice is to use wooden forms within which the wet concrete mix is poured. After the concrete has set the forms are removed. A technique used now for several decades and commonly referred to as the "lift-slab" process involves creating the walls of a building in a horizontal position and then lifting them upright. In multi-story parking structures the floors are suspended in air, and the construction technique then preferably involves the use of prestressed concrete. There is a considerable amount of special technology relating to prestressed concrete, but which has little relevance to the present invention.

6. In building a new shopping mall, for example, the design may call for a flat concrete floor that extends hundreds of feet in every direction. The ground is then prepared with a frame or grid of reinforcing steel, and the wet concrete mix is poured over the grid. A smoothing and leveling process is then used to obtain a uniform flat surface which will often need to be precisely level or with a small predetermined slope to provide for the drainage of water.

7. When such a large flat floor is being built, the wet concrete mix is poured into one section at a time, then smoothed and leveled as needed, the process being known as

"screeding". It has long been a standard practice to use a flat board or plate to be dragged over the surface of the wet concrete mix to accomplish this end. In recent years machines have been developed to expedite the process. Some such machines are equipped with a laser-guided control system to assure that a perfectly flat surface is achieved, as well as a desired slope angle, if the design calls for that.

8. Any person who has ever been involved in pouring concrete knows that the mix typically includes rocky particles of various sizes, such as sand, aggregate, and solid rock. To achieve a smooth finish surface it is necessary to push the rock and aggregate down through the soupy surface material so that they will not disrupt the smooth finish surface. Various techniques have been used for this purpose, one of which is a perforated drum or roller that is rolled along the surface of the soupy material so as to depress hard particles of greater than a certain size while allowing the soupy material to flow back again into a flat surface configuration after the roller has moved on.

9. For a number of years a laser-guided screed machine has been available, known under the name of its manufacturer as the "Somero laser-screed" machine. This machine pulls a flat blade over the surface of the wet concrete mix, and concurrently drives the blade in a vibratory motion to aid in the process.

A boom extending from a wheeled vehicle is connected to the screed blade not only to control its geometric position, but also to provide a vibratory drive motion to the blade.

SUMMARY OF THE INVENTION

10. According to the present invention I provide a process in which the wet concrete mix is leveled by a screed blade, the blade is concurrently driven in a vibratory motion to accelerate the leveling process, a perforated roller or drum is located adjacent to the blade to roll over the soupy material behind the blade, and the roller is also concurrently driven in a vibratory motion to aid in both the leveling action and in depressing the aggregate and sand down through the soupy mix so that they will not rise and alter the smooth finish surface. In accordance with my process it is essential that the perforated roller be located behind the screed blade, so that the leveling and screeding action by the blade is accomplished first and the roller contacts the soupy surface thereafter. I prefer to have the roller fairly close behind the blade.

11. Further in accordance with my invention the vibratory action imparted to the screed blade and the vibratory action imparted to the perforated roller are preferably driven from the same source of energy, to achieve efficiency. It is not

essential, however, that the drum or roller be driven with exactly the same amount of vibratory force as the screed blade, or that the vibratory motion follow precisely the same pattern of vibration. But the drum must be driven with at least a portion of the same vibratory energy imparted to the blade.

12. Thus according to the presently preferred form of my invention I provide an attachment to a laser-screed machine, in which a supporting frame for the roller is mechanically coupled to the same boom that drives the screed blade.

DRAWING SUMMARY

13. Figure 1 is a side elevation view showing in a schematic form the presently preferred apparatus of my invention;

14. Fig. 2 is a top plan view taken on the line 2 -- 2 of Fig. 1; and

15. Fig. 3 is a fragmentary cross-sectional elevation view taken on the line 3 - - 3 of Fig. 1.

DESCRIPTION OF PREFERRED EMBODIMENT

16. Referring now to the drawing, a vehicle 10 having wheels 12 moves in a forward direction as indicated by arrow 14. A boom 16 extends rearwardly from the vehicle 10 to support a vertical screed blade 18 that in turn rests upon the concrete surface 20.

17. Although the schematic drawing of Fig. 1 indicates that the concrete has a finished surface not only ahead of the screed blade but also underneath the vehicle wheels 12, the fact is that in actual practice this portion of the concrete surface is unfinished and relatively rough. Also, the screed vehicle 10 preferably operates on a portion of ground onto which the wet concrete mix has not yet been poured. The routine for moving the screed vehicle 10 into and out of an operative position, and for dumping a new batch of wet concrete mix on a new portion of ground in the interim, is a well known technique and forms no part of the present invention.

18. A boom extension 22 extends behind the screed blade 18 and is attached to a support frame 24 for the drum or roller 26. Roller frame 24 is indicated schematically as simply an axle for the drum, and may in fact be no more than that.

19. As shown in Fig. 2, the drum 26 has multiple holes or perforations 28 in its surface. These holes or perforations are large enough to accommodate a soupy mixture containing some amount of sand, but are not large enough for pebbles to pass through them. As shown in Fig. 3, pebbles 30 are depressed beneath those portions of the roller surface that are intermediate the holes or perforations 28. The weight of the drum or roller is also of significant importance. It must be great enough to cause at least some portion of the soupy mixture to pass through the holes 28, but not so great as to depress the pebbles to an unnecessary degree, or to create an excessive drag on the operation of machine 10. More specifically, the holes or perforations in the drum or roller must be large enough, and the weight of the drum must be great enough, so that small portions of the wet concrete momentarily enter into the drum perforations while the drum surface portions between the perforations serve to provide a downward force on pebbles within the concrete mix that might otherwise rise to and alter the finish surface.

20. The presently preferred form of my invention has been described in detail as required by the patent laws of the United States, but it is to be understood that the scope of the invention is to be measured only in accordance with the appended claims of invention.

WHAT I CLAIM IS: